

be, in all cases, to call to the aid of architects themselves, and to exhibit the designs publicly before the decision.

The instructions, in the first instance, should be carefully framed, with complete practical particulars as to the objects and destination of the intended building, leaving to the architect the consideration of the mode in which those objects may be obtained. Full information should be afforded as to foundations, levels, and drainage; a plan of the land should be given, and some account of the site. The amount at the disposal of the committee should be stated, with the description and cost of building materials in the neighbourhood of the intended edifice. In deciding upon the merits of the designs, the committee should either refer them to architects of eminence, unconnected with the competition, or to the competitors themselves; who should record their votes openly, no one voting for his own design. The former course was pursued in the first competition for the Royal Exchange, and, by the report of the appointed architects, it appeared that many of the designs possessed errors of construction, which would certainly have escaped the attention of any but professional men. We urge upon the attention of building committees the consideration of this important subject we have noticed. The plan is by no means new, and in some minor details might need consideration, but we are assured that no system would be worse than the present want of it, fraught, as it is, with injustice to the architect, discredit to the promoters, and with irreparable injury to the arts, and consequent standing of the country in the scale of nations. E. H.

[If the history of competitions were written, its details would show an extent of rivalry, astounding to architects themselves. We shall not fail to publish particulars of such mal-practices as come to our knowledge. The remedy unfortunately is not evident or easy.—Ed.]

ON BATH STONE.

By C. H. SMITH.

BATH stone has been used almost universally, as a mineral substance for building, in the city of Bath, during a long period. The Abbey Church, which was not finished till after the Reformation, has been in great part restored within the last thirty or forty years. The west front has been richly ornamented, especially with a representation of Jacob's ladder on each tower, reaching from top to bottom, on which many angels were carved in bold relief; these have now mouldered away, till only a few faint traces remain, just sufficient to indicate where they originally were. This building I am inclined to believe is the oldest in existence of Bath stone, and beyond doubt not a very favourable specimen of its durability. The oldest of the modern buildings of similar material in that city is, I imagine, Queen-square, erected in the beginning of the last century; the houses are ornamented with projecting mouldings, Corinthian capitals, &c.; and certainly they are not much decomposed, considering the time since they were erected.

It has been remarked that Bath stone appears to stand the weather better in the neighbourhood of the quarries than it does if removed to a distance, or in London; and, judging from the present condition of the oldest houses at Bath in comparison with Bath stone buildings of more modern date erected in London, a casual observer might indulge his imagination with the idea of something being more congenial to the stone in its native atmosphere than if removed to waste and perish in what may be termed a foreign climate. I am ready and willing to admit that there may be a very material difference between the air of Lombard-street or the Royal Exchange, and that of the land of the cuckoo and the nightingale, or any other spot far from the busy world's unceasing sound. But I cannot conceive it probable, that a stone which would last for a century or more in the city of Bath or its environs, would decompose in a quarter of that time were it placed in the Regent's-park. The plain matter of fact is, that the stone used in the construction of the oldest buildings at Bath was procured from the Box quarries, which is in the more important qualities very superior to, and far more durable than, such as is now generally used. The Box quarry stone is still used occasionally in and about Bath, but the stone merchants in London have long since

discovered that the masons will not buy it on account of its being a little coarser and harder, and thereby more expensive to work.

Coombe Down Bath stone was next introduced; it is finer grained, softer, and less durable than the Box stone; but both these have been almost entirely superseded by the grand favourite from Monkton Farleigh, or by what is usually called "Farleigh Down Bath stone." This material possesses all the qualities required by a hasty mason or contractor; it may be sawed dry, like a block, with a common peg-toothed saw, more expeditiously than any other stone; an industrious workman may do almost as much work as he pleases in it, consequently a building may be executed in this stone in a shorter space of time than in any other; and, lastly, it decomposes in a shorter space of time than any other stone, hence some people are inclined to think it "makes good for trade."

The restorations of Henry the Seventh's Chapel, at Westminster, were executed in Coombe Down Bath stone, between the years 1808 and 1821, at an expense to the nation of about forty thousand pounds. A large proportion of this amount was for the Bath stone, which has always been about as expensive in London as those of a more durable nature. If an additional ten thousand pounds had been bestowed on labour, in all probability a material might have been selected which would have lasted several centuries longer without being in an decomposing condition. But whilst the lover of elegant architecture is admiring the extreme attention that has been bestowed in preserving the true spirit of the original design, he will be annoyed at discovering abundant evidences of premature decay. Many projecting parts of that beautiful fabric are conspicuously mouldering away, in less than thirty years since they were restored. A casual observer may, by one glance at the south-eastern towers, convince himself of the truth of these statements; but on more attentive examination, a considerable portion of the masonry throughout the entire structure, especially the more exposed parts, will present multitudes of slight undulations or swellings, somewhat resembling in their progress gatherings or tumours under the skin; these increase in size and number until they meet each other, when they burst, and the surface falls off. This cankerous process will be repeated as often as a fresh surface is exposed, until all architectural features are obliterated. Such is the lamentable condition and prospective state of Henry the Seventh's Chapel at this time, that there is every probability of its being in the same dilapidated condition within thirty or forty years that it was in before the repairs were commenced in the year 1808.

That there are many stones in the building which at present show no symptoms of decomposition is readily admitted; and those persons who advocate the use of Bath stone for such highly decorative purposes frequently imagine that sufficient care has not been taken to place the stones on their natural bed. The importance of such precaution is generally very considerably overrated; I do not consider it signifies which way a stone is fixed, unless it presents a laminated structure, which scarcely ever occurs amongst the oolites. A stone of an open, powdery, and slightly cemented texture, will, if exposed to the weather, decompose in a comparatively short space of time, in whatever direction it may be fixed, or whichever surface may be parallel to the horizon.

Another generally received fallacy is the opinion that soft stone will become hard and durable by exposure. Although this notion is true to a certain extent, it is not of sufficient importance to warrant its appreciation in architectural works. All kinds of stone while in the rock, or when recently quarried, are somewhat softer and more easily worked than after they have been exposed to the atmosphere a few months, owing to the stone in its original situation being more thoroughly saturated with moisture than can ever be accomplished after

it has been once allowed to get dry. This is a principle well known to masons, for it is a general practice amongst workmen to frequently wet a stone, especially if it be rather of a hard quality, during their operation, to make it work, as they term it, "more kindly." If the stone be remarkably soft, it is advisable not to let it dry too fast after it has been taken from the quarry, for fear of its cracking. In consequence of the moisture being removed from the outside before the interior of the block can have had time to evaporate; hence, while the central part remains of its original size and extremely damp, the surface will dry, shrink, and thereby cause many invisible cracks, the effect of which will be conspicuous after a sharp frost.

All free-working limestones and oolites become in some degree harder on their surface by exposure to weather. This arises from a very slight decomposition taking place, which will remove most of the softer particles, and leave the hardest and most durable to act as a protection to the remainder. In addition to which, the pores and interstices of the surface get filled with dust and dirt, washed in by rain, assisted by powerful winds; all which circumstances help to secure the least protected grains from external violence. If the stone be naturally compact and durable, a surface of this description will materially assist its duration; but, on the other hand, such material as the Heddington stone, near Oxford, or the most perishable Bath stone, will in due time similarly attain a hard crust, which, from the general body of the stone being loose and powdery, is not sufficiently compact to hold on; water will soak in behind the crust, cause a swelling and disruption on the surface, which ultimately breaks. The crust thus opened gradually bends forward more and more, until finally the weight of the disintegrated portion causes it to fall off. In some instances, as in Bath stone, these defective places rarely exceed an inch or two of surface before the decomposed part falls off; whereas the crust of the buildings at Oxford is so remarkably tenacious that it peels off and hangs like rags, often as much as a foot superficial, before it entirely separates. Upon the whole, I do not consider it a recommendation to a soft stone to say that it gradually becomes harder on the surface.

As Bath stone is decidedly one of the most fragile mineral substances ever used for building, a few observations on its cohesive strength may be offered, less on account of their utility, than because most persons who have investigated the subject of stone for building have expatiated considerably on this head. In all cases which have come within my notice, the stone possessing the least cohesive strength, or that which will crush with less pressure than any other, is nevertheless strong enough, when once fixed, for almost all practical purposes. No architectural members have to sustain greater pressure in proportion to their size than mullions of large Gothic windows. The tracery in the great north window of Westminster Hall is now executed in Bath stone, which is remarkable for having the least cohesive strength of all the specimens experimented upon and described in the Report on the Stone for the new Houses of Parliament. Some of the mullions of that window are less than 9 inches wide, and more than 40 feet high, sustaining not only their own weight, but also the whole of the tracery beneath the arch. The eastern window of Carlisle Cathedral, built of a friable, red sandstone, is 50 feet high; the mullions are smaller and the tracery much heavier than in that at Westminster; yet in neither of these examples are there any symptoms of crushing. The cohesive strength of stones is never more severely tested than during their conversion by workmen from the rough state to being fixed in their final situation in a building. During these operations iron levers, jacks, lewis, and various other implements are applied, frequently without judgment, and with but little regard to the mechanical violence which a stone will bear; therefore, it may be considered a useful practical rule, that however soft a stone may be, if it resists the liability of damage until out of the mason's hands, there can be little doubt of its possessing sufficient cohesive strength for any kind of architectural work.—*Lithology, or Observations on Stone used for Building.—Trans. British Architects.*

* The north front of Westminster Hall was restored with similar material immediately after Henry the Seventh's Chapel was completed; it is now progressing in the same state towards decay. During the spring of the year 1850, the stonework about the principal entrance was washed by means of an engine; this operation mutilated the projections in a slight degree, the force of the jet of water separating many small portions of stone from the prominent parts that were already in a decomposing state. The restorations of Westminster Abbey, north side, are proceeding slowly with Bath stone, apparently from Farleigh Down quarries; it is to be regretted that a more durable stone is not used, since there is unequivocal proof of its perishable quality in the adjoining edifice.

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